" Welcome Shelter Near Trail's End "

FEDERAL-STATE COOPERATIVE SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for

MONTANA

APRIL 1, 1947

by

Montana Agricultural Experiment Station
and
Division of Irrigation, Soil Conservation Service
United States Department of Agriculture

in cooperation with

U. S. Forest Service
U. S. Geological Survey
U. S. National Park Service
State Engineer of Montana

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FEDERAL-STATE COOPERATIVE

SNOW SURVEYS AND IRRIGATION WATER FORECASTS

FOR

MONTANA

Report Prepared

by

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Soil Conservation Service
State Engineer of Montana
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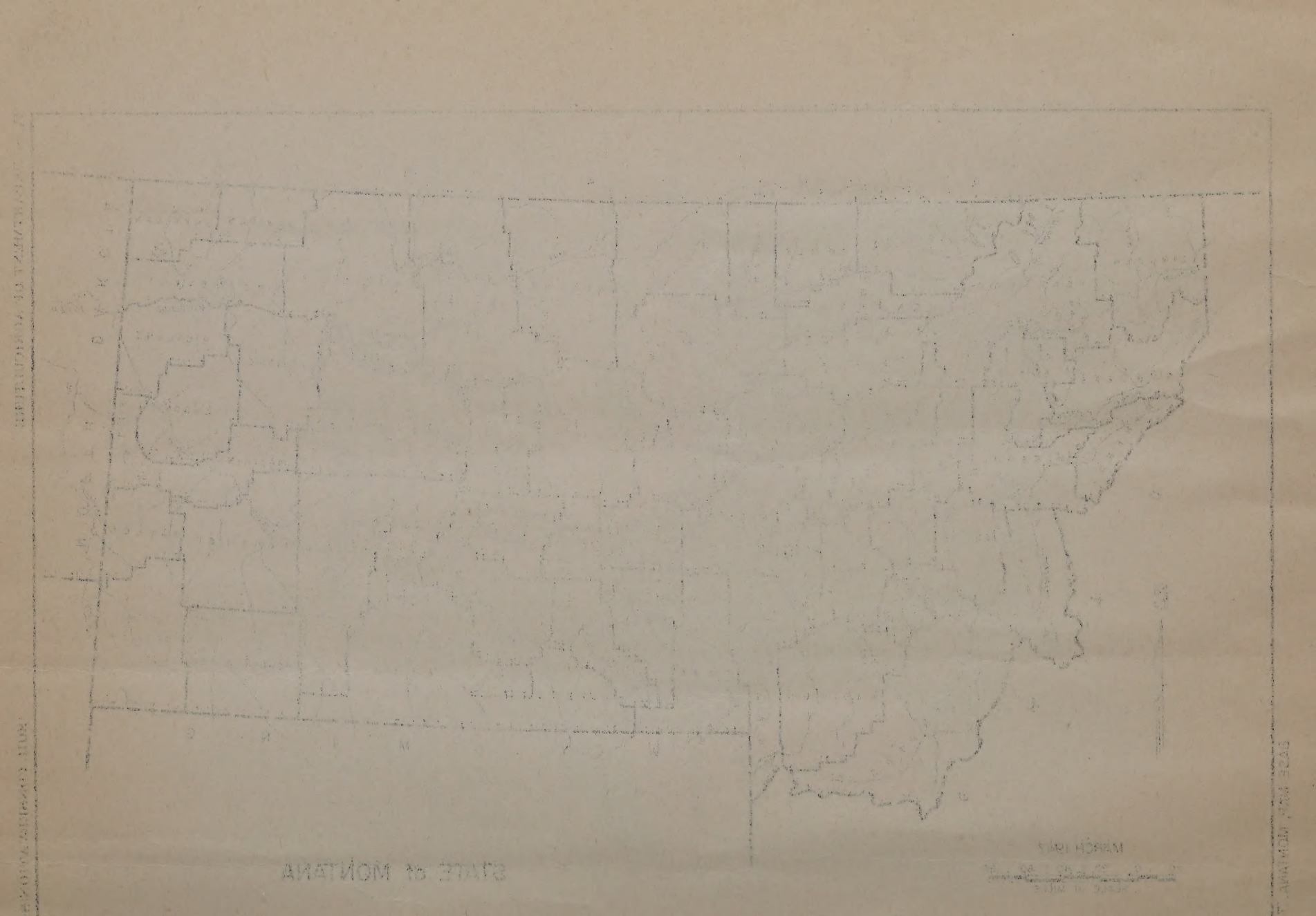

U. S. DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

BASE MAP, MONTANA, 7-L-1072

SUMMARY OF FORECAST

Above normal precipitation, largely in the form of snow, during the latter part of March and first part of April, has apparently reversed the dry trend that was beginning to develop. The prospects for a normal to above normal runoff during the irrigation season are now very good. The water content of the snow pack is above average, and more than enough water is in sight to fill existing reservoir capacity. If a normal rainfall occurs during the spring and summer months, a well sustained late summer flow can be expected.

The amount of water now held in reservoirs is greater than a year ago in both the Columbia and Missouri Basins.

Soil moisture as reported by Havre, Moccasin and Huntley Branch Stations has penetrated deeper than average.

A supplementary report will be issued about May 10th.

Stream	Gaging Sta.	FORECAST FOR 1947 Second Foot days May-June	July-Aug.-Sept.	ACTUAL RUNOFF-SECOND FOOT DAYS May - June 1946	1945	1944	July - Aug. - Sept. 1946	1945	1944	Reliability of Forecast
Missouri Basin										
Hyalite	Ranger Sta.	10,392	Normal	8,125	10,241	11,107	5466	7,168	6,582	Good
Gallatin	Gal. Gateway	137,704	Normal	133,880	112,145	127,767	63880	81,715	69,624	Good
Madison	W. Yellowstone	58,073	47,720	Not Available	44,680	41,866	Not A.	38,988	36,698	Fair
Musselsh.	Delpine	1,970	1,100	Not Available	1,137	1,076	Not A.	875	1,135	Fair
Yellowst.	Corwin Sprs.	549,098	380,455	494,480	416,890	387,620	269,680	457,590	301,480	Good
Yellowst.	Billings	1,191,184	Normal	961,420	998,500	1,138,910	- -	977,450	800,930	Fair
Columbia Drainage										
Bitterroot	Darby	211,000	80,200	Not Available	---	110,286	Not A.	---	37,885	Fair

NARRATIVE FORECASTS

Missouri Basin

Gallatin River - The average water content of the snow pack at 6 locations on the Gallatin water shed is still about 3% less than last year but is about 20% above the average for the past 9 years.

Madison River - The average of 4 locations on the Madison water shed showed the water content to be 19% less than a year ago but only 10% below the average for the period of record.

Jefferson River - The average water content at 5 locations on the Jefferson water shed is 8% greater than last year and about 29% greater than the average for the period of record.

Main Stem above Great Falls - At six locations on tributary water sheds the average water content is 42% greater than it was a year ago and is 38% above the average for the period of record.

Sun River- The water content on the Goat Mountain snow course is 80% above last year and over 100% above the average for the past 9 years which covers the period of record.

Marias River - The average water content at two locations is 30% Greater than last year and 38% greater than the average over the period of record.

Mussellshell River - The average water content at 5 locations on the Mussellshell water shed is 23% above last year and 28% greater than the average.

Yellowstone Basin

Main Stem above Livingston - The average water content on six snow courses in Yellowstone Park is just equal to that of a year ago but is 13% above average for the period of record.

Shields River - At the Porcupine Ranger Station the water content on April 1st was 45% above last year and represents approximately an average condition for the 8 year period of record.

Boulder River - The water content on the Independence snow course is 5% above 1946 and 39% above the average for the 7 year period of record.

Clarks Fork - The average water content at 2 locations is 23% above last year and 30% above the 10 year average.

COLUMBIA DRAINAGE BASIN

Bitterroot River - The average water content is approximately 15% greater than last year and 37% above the average for the 9 year period of record.

Blackfoot River - Moisture conditions on the Blackfoot water shed are similar to those on the Bitterroot being 15% above last year and 39% above the average.

Clarks Fork above Milltown - The average water content at 7 locations on April 1st was 24% above that of a corresponding date in 1946 and 36% above the average for the period of record.

Clarks Fork below Milltown - At 4 locations the average water content on April 1st was about 4% above last year, but was 33% more than the average for the 11 year period of record.

Flathead River - Snow surveys made at 3 locations indicate an average water content 13% above last year and 50% above the average for the period of record.

SOIL MOISTURE

Reports from Branch Stations at Havre, Moccasin and Huntley indicate favorable moisture conditions on dry lands in those areas. At Huntley and Moccasin the moisture has penetrated to a depth of 20 inches. At Havre the penetration was reported to be 25 inches on fallow land and 16 to 18 inches on stubble land. At the last two stations the precipitation during the late winter and early spring was reported to be considerably above average.

RESERVOIR STORAGE

The water held in 23 reservoirs in the Missouri Basin as of April 1 amounted to 74% of the useable capacity as compared to 64% on a comparable date last year. Fort Peck Reservoir was 79% full as of April 1. A year ago on the same date it was 68% full.

Seventeen reservoirs in the Columbia Basin held 39% of the useable capacity as compared to 38% a year ago.

In view of the above average snow pack on the high water sheds, there is every assurance that all reservoirs will fill to capacity.

STORAGE IN RESERVOIRS OF MONTANA

COLUMBIA RIVER BASIN — MARCH 31, 1947

DATA FURNISHED BY OPERATING ORGANIZATIONS

COMPILED BY WATER RESOURCES BRANCH, U.S. GEOLOGICAL SURVEY, HELENA, MONT.

Reservoir	Located on or diverting from	Usable Capacity Acre-feet	Contents this date Acre-feet	Contents a year ago Acre-feet
Irrigation Purposes				
b Nevada Creek Res.	Nevada Cr. Res.	12,600	*12,450	9,820
b W. Fork Bitterroot	W. Fork Bitterr.	31,700	*10,000	10,000
d Little Bitterroot Lk.	Lt.Bitterroot	18,000	5,100	1,350
d Hubbert Res.	Lt.Bitterroot	12,100	3660	1,510
d Upper Dry Fork	Dry Fork Cr.	2,700	1260	355
d Dry Fork Res.	Dry Fork Cr.	4,000	3570	1070
d Twin Res. Canals	Mission Valley	600	238	415
d Pablo Res. Canals	Mission Valley	25,000	6,950	3,660
d Lower Crow Res.	Crow Creek	10,350	8,730	8,850
d Kicking Horse Res.	Mission Valley	8,350	5,580	3,260
d Ninepipe Res.	Mission Valley	14,870	8,480	9,880
d McDonald Res.	Post Creek	8,225	6.520	7,180
d Mission Res.	Mission Creek	7.250	1,600	3,420
d Tabor Res.	Dry Creek	23,300	1,780	6,440
d Lower Jocko	Mission Valley	7,600	0	0
Power Purposes				
a Georgetown Lake	Flint Creek	31,000	21,740	22,780
b Flathead Lake	Flathead River	*1,791000	688,300	658,700

Data furnished by:

a Montana Power Company
b Montana State Water Conservation Board
c Bitterroot River Irri. District
d Office of Indian Affairs

** Within Week of Month-End

* Contents at elev. 2893, considering 2878 as base. Contents at authorized min. elev. 2883, 572,300 acre-feet.

STORAGE IN RESERVOIRS OF MONTANA

MISSOURI RIVER BASIN — MARCH 31, 1947

DATA FURNISHED BY OPERATING ORGANIZATIONS

COMPILED BY WATER RESOURCES BRANCH, U.S. GEOLOGICAL SURVEY, HELENA, MONT.

Reservoir	Located on or diverting from	Usable Capacity Acre-feet	Contents this mo.	Contents year ago
Power Purpose				
[a] Lake Sewall	Missouri R.	37,800	37,360	35,100
[a] Hauser Lake	Missouri R.	52.090	47,920	47,920
[a] Holter Reservoir	Missouri R.	73,600	65,990	79.060
[a] Hebgen	Madison R.	34 5000	220,200	179,600
[a] Madison	Madison R.	41,000	37,740	38,350
[a] Mystic Lake	W. Rosebud Cr.	20,800	8,880	9,290
Lake Helena	Missouri R.	10,450	8,270	8,270
Irrigation Purpose				
[c] Ruby Reservoir	Ruby R.	38,850	38,850	34,670
[d] Gibson R.	N. Fk. Sun R.	105,000	†58,590	†68,860
[d] Willow Creek	N. Fk. Sun R.	32,300	†15,270	†11,240
[d] Pishkun Res.	N. Fk. Sun R.	32,000	†17,230	†22,780
[e] Lower Two Medicine	Two Medicine	14,000	0	0
[e] Four Horns	Badger Cr.	20,000	10,700	5,500
[f] Birch Creek Res.	Birch Cr.	30,000	26,290	22,510
[f] Lake Francis	Birch & Dupuyer	112,000	103,900	96,040
[c] Ackley Lake	Judith R.	5,820	5,240	2,450
[d] Fresno Res.	Milk R.	127,200	136,700	61.810
[d] Sherburne Lake Res. *	Swiftcurrent	66,100	25,080	24,080
[c] Deadman's Basin	Musselshell R.	52.500	47,000	47,000
[c] Harrison Lake	Willow Creek	17,760	†12,000	4600 ††
[c] Durand Reservoir	N.Fk.Musselshell	7,010	7,040	5,760
[c] Martinsdale Res.	So.Fk.Musselshell	23,100	8,540	9,480
[d] Nelson Res.	Milk River	66,800	†28,000	28,560
Navigation & Power				
[b] Ft. Peck Res.	Missouri R.	19000,000	14980000	12,890,000

Data furnished by:

a Montana Power Company
b U.S. Army Engineers
c Montana State Water Cons. Board
d Bureau of Reclamation
e Office of Indian Affairs
f Valier Montana Land & Water Co.
g Since Apr. 26, 1945, Lake Helena has been separated from Hauser Lake by control works permitting independent regulation.

* Storage for Milk River Project
† First Day of following month
†* Jan. 13
†† Mar. 15
± Within week of month-end
†* Estimated on basis of unofficial report.

U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
STATE OF MONTANA, MONTHLY PRECIPITATION FOR
OCTOBER 1, 1946 - MARCH 31, 1947

STATIONS	1946 OCTOBER		1946 NOVEMBER		1946 DECEMBER		1947 JANUARY		1947 FEBRUARY		1947 MARCH		1947 APRIL	
	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.	Precip.	Dep.
WEST OF DIVIDE														
Butte	1.84	-1.05	1.19	+0.79	0.66	+0.22	0.65	+0.25	0.53	+0.11	0.77	+0.13		
Deer Lodge	2.17	+1.49	1.31	+0.76	2.41	+1.90	0.18	-0.41	0.35	-0.08	0.29	-0.32		
Hamilton	2.84	+1.93	2.19	+1.38	2.43	+1.72	0.44	-0.35	1.14	+0.39	0.36	-0.33		
Kalispell	3.18	+2.12	1.99	+0.64	1.82	+0.37	1.00	-0.57	0.90	-0.21	0.90	-0.05		
Missoula	2.33	+1.38	0.82	-0.08	1.43	+0.48	0.42	-0.43	1.05	+0.25	0.47	-0.35		
CENTRAL DIVISION														
Babb	4.61	+3.43	1.38	+0.39	0.89	-0.05	0.70	-0.24	0.77	-0.05				
Dillon	1.35	+0.41	0.75	-0.05	0.23	-0.51	0.12	-0.71	0.32	-0.40	0.49	-0.67		
Fort Benton	1.77	+1.05	0.63	+0.04	0.73	+0.27	0.25	-0.41	0.87	+0.38	0.90	+0.28		
Great Falls	1.53	+0.67	1.78	+1.10	0.86	+0.21	0.50	-0.11	0.71	+0.16	1.47	+0.61		
Havre	1.26	+0.59	0.66	+0.05	0.56	-0.05	0.23	-0.50	0.37		1.00	+0.49		
Helena, WBO	1.24	+0.63	0.89	+0.04	0.94	+0.47	0.34	-0.22	0.37	0.00	1.10	+0.31		
Livingston	1.98	+0.81	0.49	-0.31	0.74	+0.14	0.14	-0.40	0.41	-0.13	1.62	+0.65		
Lewistown Arpt.	2.07	+1.71	0.62	+0.41	0.57	+0.37	0.22	-0.51	0.57		1.35	+0.32		
Mystic Lake	4.11	+2.27	1.12	-0.46	1.32	+0.28	0.51	-0.63			3.59	+1.54		
Bozeman	2.35	+0.93	0.85	-0.15	0.59	-0.39	0.83	-0.04	0.44	-0.27	3.02	+1.62		
EASTERN DIVISION														
Billings #2	2.43	+0.98	0.66	-0.10	0.86	+0.22	0.39	-0.24	0.54		0.63	-0.34		
Circle	1.35	+0.50			0.28	-0.47	0.30	-.037	0.10	-0.51	0.19	-0.81		
Frazer	0.97	+0.09	0.55	+0.02	0.55	+0.16	0.89	+0.48	0.30	-0.04	0.69	-0.01		
Malta	0.82	+0.09	0.33	-0.08	0.42	-0.04	0.10	-0.37	0.25	-0.12	0.57	+0.03		
Mildred	3.43	+2.69	0.79	+0.42	0.91	+0.59	0.13	-0.21	0.12	-0.14	1.03	+0.61		
Medicine Lake	1.02	+0.27	0.24	-0.09	0.35	+0.07	0.16	-0.15	0.02		0.15	-0.26		
Miles City	3.20	+2.30	0.41	-0.16	0.52	-0.11	0.34	-0.32	0.19		1.10	+0.24		
Fort Peck	0.47	-0.28	0.46	-0.01	0.38	+0.10	0.11	-0.27	0.11		0.34	-0.16		

Montana SNOW SURVEYS April 1 ,1947

MISSOURI BASIN

WATERSHED and SNOW COURSE	LOCATION No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	Snow Depth (inches) 1947	SNOW COVER MEASUREMENTS Water Content (inches) Same 1947	Approx. 1946	Date 1945	Past Record Years of Record	Past Record Av. Water Content (inches)
Gallatin River												
Devil's Slide	Mont. 1	14	5S	6E	8100	3/29	76.3	22.6	24.2	15.1	9	18.8
Hood Meadow Ext.	" 2	22	4S	6E	6600	3/29	36.4	10.8	8.4	6.2	9	7.6
New World	" 4	24	3S	6E	6600	4/5	49.7	9.2	9.8	8.6	8	9.4
Ross Peak	" 5	10	1N	6E	7000	4/1	27.1	7.4	9.6	5.5	8	6.8
21 Mile	" 6	1	11S	5E	7150	3/30	54.0	17.8	20.0	10.0	11	15.6
320 Ranch	"	12	9S	3E	6600	3/29	14.3	10.25	8.0	4.2	7	6.8
Madison River												
Hebgen Lake	" 7	22	11S	3E	6550	3/30	32.8	11.0	15.3	8.2	11	11.9
Norris Basin	" 9	44.3N		110.7W	7500	4/3	35.0	8.8	8.7	7.6	12	9.5
21 Mile	" 6	1	11S	5E	7150	3/30	54.0	17.8	20.0	10.0	11	15.6
West Yellowstone	" 8	34	13S	5E	6700	3/31	33.1	8.3	12.6	7.3	11	13.8
Jefferson River												
Elkhorn	" 11	15	4S	12W	8450	3/29	36.3	11.1	9.9	6.0	9	8.3
Flashlight	" 10	22	8S	7W		3/31	13.9	4.2	6.5	5.0	3	5.2
Gibbons Pass	" 13	4	2S	19W	7100	3/31	67.6	26.8	25.4	16.5	9	20.6
Miner Lake	" 12	10	6S	16W		4/1	34.9	10.2	7.6	5.5	3	7.7
Pipestone	" 14	11	1N	7W	7200	4/3	23.0	7.0	5.7	5.1	9	5.3

Montana SNOW SURVEYS April 1 ,1947

MISSOURI

DRAINAGE BASIN and SNOW COURSE	LOCATION No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	SNOW COVER MEASUREMENTS Snow Depth (inches) 1947	Water Content (inches) Same 1947	Approx. 1946	Date 1945	Past Record Years of Record	Past Record Av. Water Content (inches)
Main Stem Above Great Falls												
Chesman	Mont.	18 2	8N	6W	6200	4/1	15.3	4.7	2.4	3.6	12	4.0
Kings Hill	"	25 35	13N	7E	7950	3/31	54.4	15.4	17.4	9.5	9	12.3
Rimini Lower	"	15 13	8N	6W	6250	4/2	28.4	7.8	3.8	5.6	12	5.7
Rimini Middle	"	16 13	8N	6W	6800	4/2	47.5	14.2	7.9	8.2	12	9.5
Rimini Upper	"	17 19	8N	5W	8000	4/2	56.0	17.5	10.8	12.0	12	12.3
Stemple Pass	"	19 16	13N	7W	6900	3/31	43.0	13.0	8.6	9.2	9	8.6
Sun River												
Goat Mt.	"	20 47.5N		112.9W	7000	4/2	45.3	17.8	9.9	6.6	9	8.6
Marias River												
Marias Pass	"	21 48.3N		113.4W	5250	3/31	60.8	23.3	17.7	12.5	12	15.6
Rocky Boy	"	22 15	28N	16E	5200	3/31	18.0	5.6	4.5	3.1	6	5.4
Mussellshell R.												
Crystal Lake	"	24 24	12N	17E	6100	3/29	44.7	11.9	10.8	8.6	7	11.4
Grasshopper	"	27 19	9N	8E	7000	4/3	36.5	8.5	3.6	2.9	10	4.7
Half Moon	"	23 22	12N	18E	6000	4/2	30.2	8.3	7.2	5.4	8	7.5
Kings Hill	"	25 35	13N	7E	7950	3/31	54.4	15.4	17.4		9	12.3
Orville Harris	"	26 31	10N	9E	6500	4/1	31.3	7.9	3.1	4.0	10	4.7

MONTANA SNOW SURVEYS APRIL 1, 1947

YELLOWSTONE

DRAINAGE BASIN and SNOW COURSE	LOCATION						Date of Survey	SNOW COVER MEASUREMENTS					Past Record
	No. or State	Sec. -- Lat.	Twp. (or)	Range - - Long.	Elev.			Snow Depth (in.) 1947	Water Content (inches) Same 1947	Approx. 1946	Date 1945	Years of Record	Av. Water Content (inches)
Main Stem													
Blacktail Deere	Mont.	4	44.9N		110.6W	7500	3/31	44.4	12.1	14.3	-	4	13.2
Canyon	"	2	44.7N		110.5W	7750	4/1	46.4	12.8	11.9	8.2	10	10.6
Crevice Mt. #1	"	5	26	9S	9E	8400	4/1	41.0	11.2	9.4	7.3	13	9.3
Crevice Mt. #2	"	6	25	9S	9E	8150	4/1	42.9	12.2	9.9	7.2	13	9.3
Lake	"	1	44.6N		110.4W	7850	4/2	41.1	12.3	12.6	8.2	12	10.2
Lupine	"	3	44.9N		110.6W	7300	3/31	38.1	9.9	12.2	5.2	5	9.9
Shields River													
Porcupine	"	7	10	4N	10E	6500	4/1	21.5	5.5	3.8	3.3	8	3.8
Boulder River													
Independence	"	9	22	7S	12E	8000	4/3	70.3	22.7	21.5	13.8	7	16.3
Clarks Fork													
Camp Senia	"	11	2	8S	18E	7890	3/31	36.4	9.8	8.0	9.3	10	7.1
Cooke City	"	10	25	9S	14E	7400	3/31	33.1	8.3	6.6	4.5	10	6.7

MONTANA SNOW SURVEYS APRIL 1, 1947

COLUMBIA

DRAINAGE BASIN and SNOW COURSE	LOCATION No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	SNOW COVER MEASUREMENTS Snow Depth (inches) 1947	Water Content (inches) Same 1947	Approx. 1946	Date 1945	Years of Record	Past Record Av. Water Content (inches)
Bitterroot												
Gibbons Pass	Mont. M13	4	2S	19W	7100	3/31	67.6	26.8	25.4	16.5	9	20.6
Skalkaho	" 7	30	6N	17W	7258	4/1	73	29.9	23.7	16.2	9	20.7
Blackfoot R.												
Stemple	" M-19	16	13N	7W	6900	3/31	43	13.0	8.6	9.2	14	8.6
Stuart Mt.	" 9	6	14N	18W	7400	4/1	93	38.2	36.0	29.3	11	28.2
Clark Fork-Above Milltown												
Intergaard	Mont. 6	6	5N	13W	6450	3/31	23.7	7.0	6.2	5.8	3	6.3
Skalkaho	" 7	30	6N	17W	7258	4/1	73	29.9	23.7	16.2	9	20.7
Slide Rock Mt.	" 8	26	10N	16W	7100	4/1	51	16.5	13.7	10.3	10	12.2
Southern Cross	" 5	9	5N	13W	6500	3/31	10.3	3.4	3.2	2.2	2	2.9
Stemple	"M19	16	13N	7W	6900	3/31	43.0	13.0	8.6	9.2	9	8.6
Storm Lake	" 3	19	4N	13W	7780	3/29	55.8	17.6	14.0	8.8	9	13.1
Stuart Mill	" 4	19	5N	13W	6500	3/29	18.3	4.9	5.0	2.9	3	4.2
Clark Fork below Milltown												
Freezout Mt.	Mont. 12	21	15N	27W	7000	4/1	104.0	39.8	34.2	22.6	11	28.4
Hoodoo Creek	" 11	9	14N	27W	6200	3/31	132.0	57.2	53.0	40.4	11	42.4
Lookout	Idaho	4	47N	6E	5250	3/31	93.8	36.8	41.8	27.8	11	29.3
Packers Meadow	"	15	38N	15E	5700	3/31	59	24.0	22.6	16.4	11	18.7

Montana SNOW SURVEYS April 1 ,1947

COLUMBIA

DRAINAGE BASIN AND SNOW COURSE	LOCATION No. or State	Sec. -- Lat.	Twp. (or)	Range -- Long.	Elev.	Date of Survey	SNOW COVER MEASUREMENTS Snow Depth (inches) 1947	Water Content (inches) Same 1947	Approx. 1946	Date 1945	Past Record Years of Record	Past Record Av. Water Content (inches)
Flathead												
Hell Roaring Creek	Mont. 16	7	22N	18W	6750	3/26	127.0	52.1	46.0	34.7	7	34.0
Marias Pass	" M-21	48°19N		113°21'W	5250	3/31	60.8	23.3	17.7	12.5	12	15.6
No. Fork Jocko	" 13	3	17N	17W	6330	3/29	125.6	52.0	48.5	36.9	7	36.6
Stuart Mt.	" 9	6	14N	18W	7400	4/1	93.0	38.2	36.0	29.3	11	28.2